Biota Transfer In The United States And Canada

Major Potential Pathways For Biota Transfer

NORTH DAKOTA
State Water Commission

Biota Transfer In The United States And Canada

Stocking

NORTH DAKOTA
State Water Commission

Biota Transfer In The United States And Canada

Anglers & Boats

NORTH DAKOTA
State Water Commission

Biota Transfer In The United States And Canada

Meteorological Events

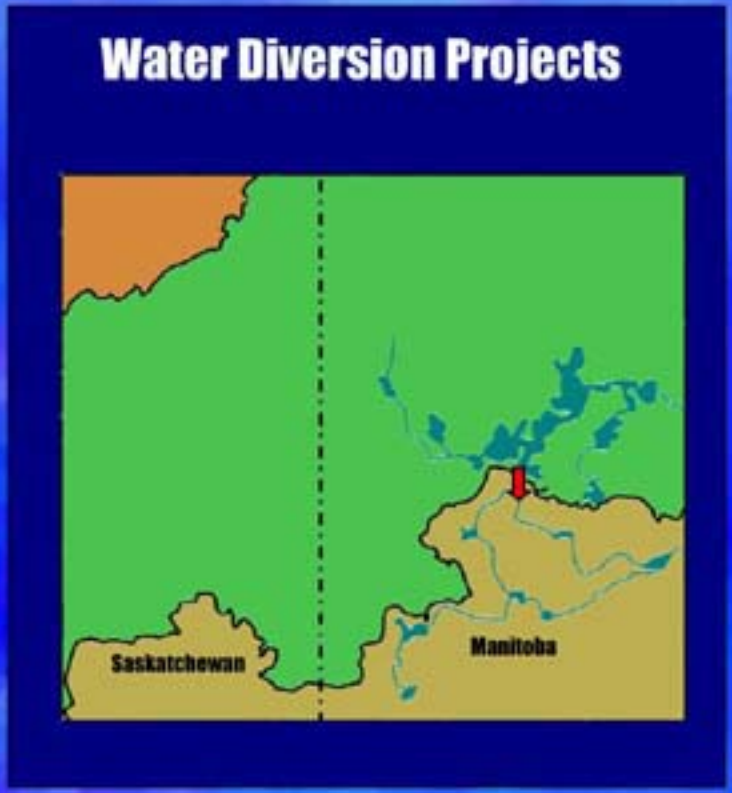
NORTH DAKOTA
State Water Commission

Biota Transfer In The United States And Canada

Animal Transport

NORTH DAKOTA
State Water Commission

Biota Transfer In The United States And Canada



NORTH DAKOTA
State Water Commission

Fish Stocking Facts

Manitoba Conservation - Fisheries Branch Website, 2002

MANITOBA:
- 5 species stocked
- 6.8M stocked in 2001
- 57 waterbodies stocked
- 300 lakes, 70 creeks commercially fished
- 80 fish species found

Ontario Conservation - Fisheries Branch Website, 2002

ONTARIO:
- 11 species stocked
- 8.5M stocked every year
- 11,000 lakes & rivers stocked
- 155 fish species found

NORTH DAKOTA:
- 26 species stocked
- 5M stocked in 2001
- 16 major waterbodies stocked
- 350 minor waterbodies stocked
- 96 fish species found

ND Game & Fish Website, 2002; Northern Prairie Wildlife Research Center Website, 2002

MN DNR Website, 2002

MINNESOTA:
- 17 species stocked
- 17 hatcheries
- 334M stocked Jul 98-Jun 99
- 506 lakes stocked
- 5,493 fishable lakes
- 144 fish species found

ROLE OF AQUACULTURE

Courtenay and Williams, 1992; Leitch and Tenamoc, 2001; OTA, 1993

Aquaculture

Angler Facts

Manitoba Conservation - Fisheries Branch Website, 2002

MANITOBA:

225,000
Domestic Anglers
38,000 Foreign Anglers
in 1995

Ontario Conservation - Fisheries Branch Website, 2002

ONTARIO:

4,200,000 Total Anglers
1,500,000 Resident Anglers in 2001

Personal Communication with Terry Steinwand, 2002

NORTH DAKOTA:

136,000 resident
40,000 non-resident
in 2001-02

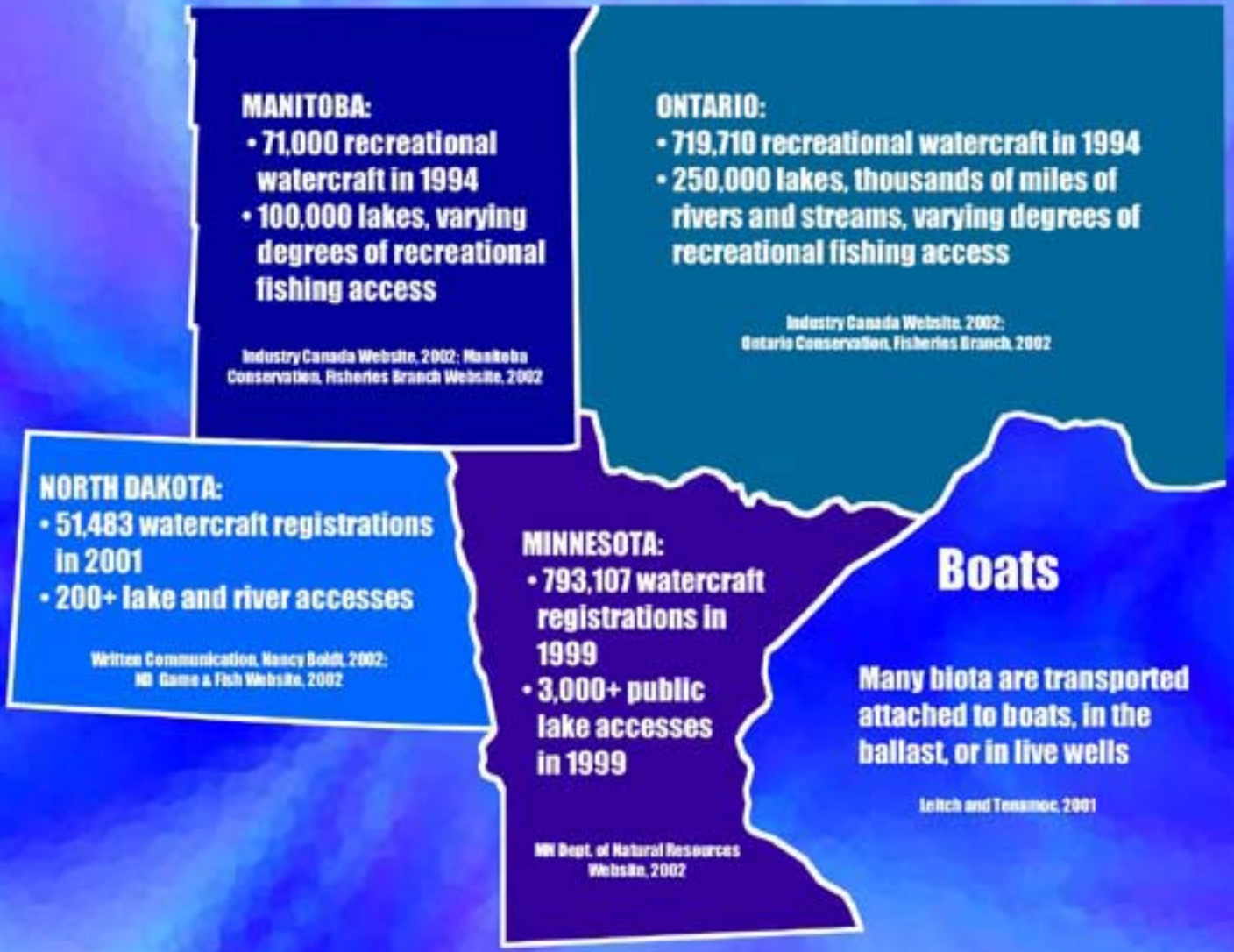
MN DNR Website, 2002

MINNESOTA:

2,300,000
Anglers in 1999

"BAIT BUCKET" Effect

Leitch and Tenamoc, 2001


MANITOBA:
• 71,000 recreational watercraft in 1994
• 100,000 lakes, varying degrees of recreational fishing access
Industry Canada Website, 2002; Manitoba Conservation, Fisheries Branch Website, 2002
ONTARIO:
• 719,710 recreational watercraft in 1994
• 250,000 lakes, thousands of miles of rivers and streams, varying degrees of recreational fishing access
Industry Canada Website, 2002; Ontario Conservation, Fisheries Branch, 2002
NORTH DAKOTA:
• 51,483 watercraft registrations in 2001
• 200+ lake and river accesses
Written Communication, Nancy Boldt, 2002; ND Game & Fish Website, 2002
MINNESOTA:
• 793,107 watercraft registrations in 1999
• 3,000+ public lake accesses in 1999
MN Dept. of Natural Resources Website, 2002
Boats
Many biota are transported attached to boats, in the ballast, or in live wells
Leitch and Tenamoc, 2001

Animal Transport

- Transport of biota is highly likely by various animals. . .
  Oral Communication, Barker, 2001; Clambey et al, 1983
- Possible biotic vectors include: birds, mammals, insects, amphibians, reptiles, invertebrates, fish. . .
  Clambey et al, 1983
- Likely biota to be transported: algae, plants, insects, microbes, invertebrates, fish. . .
  Oral Communication, Barker, 2001; Clambey et al, 1983; Masaki et al, 1994; Smith et al, 1964

Meteorological And Flood Events

- Water through Stump Lake into Sheyenne R. at least twice in the last 4,000 years…
  USGS, 2000
- Anecdotal and observed interbasin water flow in 1995, 1997, and 2002…
  SWC, 2002; SWC Memo, 2000; NDGF Memo, 1995
- North Dakota experiences strong pluvial and drought cycles…
  NOAA Website, 2002; Oral Communication, Richardson, 2001
- "Freak" weather events DO occur—tornadoes, waterspouts, etc…
  Leitch and Tenamoc, 2001

Big Stone Lake To Lake Traverse

Hudson Bay Basin

Mississippi River Basin

Little Minnesota River To Lake Traverse Connection

Bertchsi, 1994; USACE, 2000; National Atlas.Gov, 2002; Personal Comm. With Scott Jutila, USACE, 2003

Big Stone Lake To Lake Traverse

- Natural Interbasin Flow Between Little Minnesota River (Mississippi River) And Lake Traverse (Hudson Bay)
- Anecdotal, Observed, And Documented Connections In 1820, 1916, 1930 1943, 1993, 1997, 2001
- People Have Boated Across The Divide Historically
- Flow Now Occurs From The Little Minnesota River Through The Browns Valley Dike To Lake Traverse
- No Biota Transfer Controls Indicated

Hudson Bay Basin

Mississippi River Basin

Little Minnesota River To Lake Traverse Connection

Bertchsi, 1994; USACE, 2000; National Atlas.Gov, 2002; Personal Comm. With Scott Jutila, USACE 2003

Big Stone Lake To Lake Traverse

Memo, USACE, 2000 ; Personal Comm. With Scott Jutila, USACE, 2003

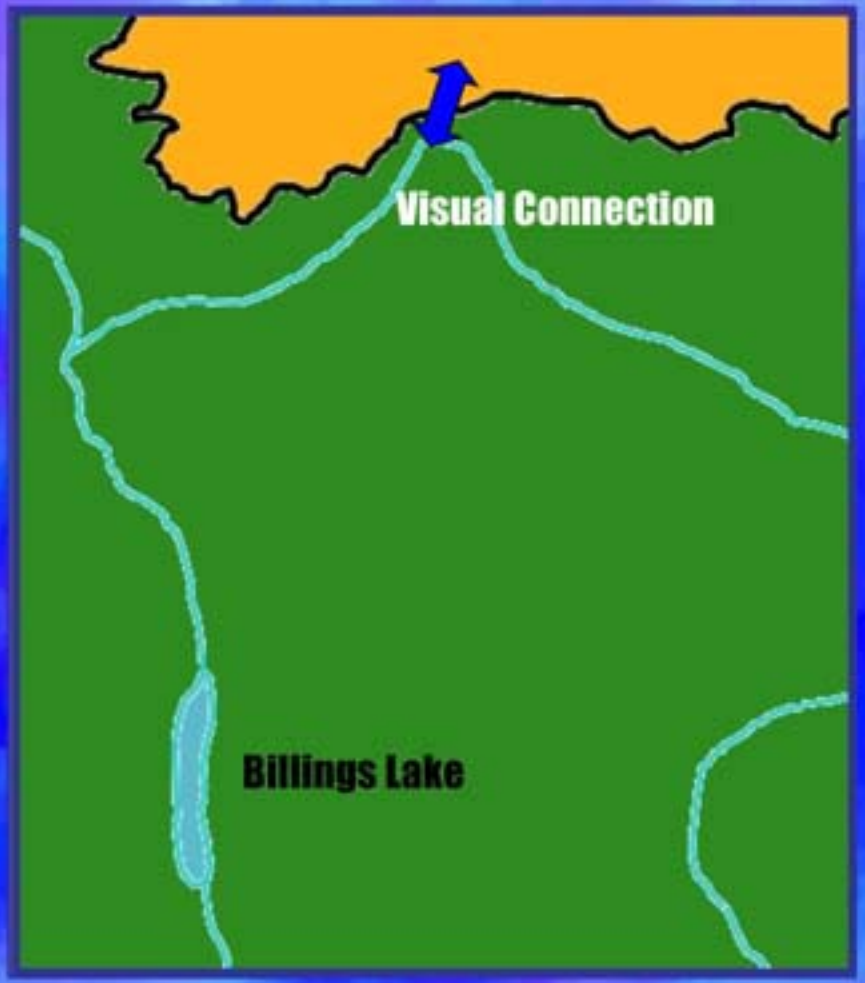
Big Stone Lake To Lake Traverse

Personal Comm. With Scott Jutila, USACE, 2003

Natural Interbasin Transfer Points of the Devils Lake Sub-basin

NDSWC Memo, 2002; NDSWC Memo, 2000; NDGF Memo, 1995

Billings Lake



Devils Lake Basin

Hudson Bay Basin

Billings Lake

- Natural Connection Between Devils Lake Basin And Red River Basin
- Connection Observed: Aerial Photograph In 2000, On The Ground In 2003
- 2003 Connection Occurred After A Dry Winter
- In 2004, Connection Was Measured To Have A Flow of 15 cfs
- Devils Lake Is NOT A Closed-Basin

Devils Lake Basin

Red River Basin

Billings Lake

Work By The NDSWC, NDGF, DLBJWRB And County Water Boards To Address The Natural Connection Issue

Several Meetings Already Held: Oct, Nov, Dec (2004), and January (2005)

Discussing Potential Actions To Prevent Biota Transfer Of ANS From The Red River Basin Into The Devils Lake Basin

Options Include: Physically Closing Basin Divide, Treatment Measures, No Action

Billings Lake

April 12th, 2003
Looking South From South End of Culvert
Water Is Flowing North

Larry Gellner, 2003

Billings Lake

April 12th, 2003
Looking Southwest From South End of Culvert
Water Is Flowing North

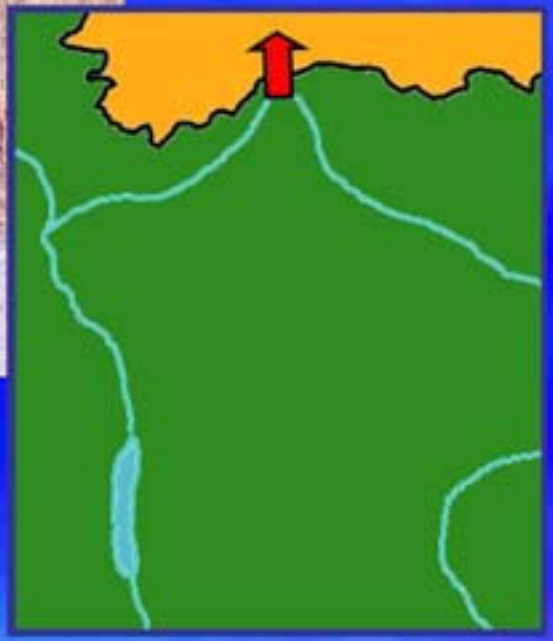
Larry Gellner, 2003

Billings Lake

April 12th, 2003
Looking Northwest From North End of Culvert
Water Is Flowing North

Larry Gellner, 2003

Billings Lake



April 12th, 2003
Looking North From North End of Culvert
Water Is Flowing North

Larry Gellner, 2003

A Partial List Of Existing Water Transfer Projects

Canada Drainage Basins, 1985 ; National Atlas.Gov, 2002

1. Milk River And St. Mary River Diversions (Montana And Alberta)
2. Churchill River Diversion (Manitoba)
3. Lake St. Joseph Diversion (Ontario)
4. Long Lake And Ogoki River Diversions (Ontario)
5. Chicago Sanitary And Ship Canal (Illinois))
6. Closed Basin Lake Outlets (Minnesota)

St. Mary River And Milk River Diversions

- Missouri River Basin
- Hudson Bay Basin
- Internal Drainage Basin
- Pacific Ocean Basin
- St. Mary R. Diversion
- Milk R. Irrigation

Canada Drainage Basins, 1985 ; National Atlas.Gov, 2002; Personal Comm. With Derrick Jaffray, 2002; SMRID Webpage, 2002

St. Mary River And Milk River Diversions

- Purpose: Irrigation in Montana And Alberta
- Constructed By: USBR And Alberta
- Constructed: Montana Project 1915, Alberta Project 1890's And 1970
- Flow: MT Project 650 cfs, AB Project <25 cfs (19.1 m^3/s)
- Connections: Missouri River Basin And Hudson Bay Basin
- Biota Transfer Controls: None Indicated

Missouri River Basin
Hudson Bay Basin
Internal Drainage Basin
Pacific Ocean Basin
St. Mary R. Diversion
Milk R. Irrigation

Canada Drainage Basins, 1985 ; National Atlas.Gov, 2002; Personal Comm. With Derrick Jaffray, 2002; SMRID Webpage, 2002

The Churchill River Diversion

Arctic Ocean Basin

Churchill River Basin

Nelson River Basin

Churchill River Diversion

Canada Drainage Basins, 1985; Manitoba Hydro Website, 2002; National Atlas.Gov, 2002

The Churchill River Diversion

- Purpose: Hydroelectric Power Generation
- Constructed By: Manitoba Hydro
- Constructed: 1976
- Flow: 26,838 cfs (760 m^3/s)
- Connections: Churchill R. to Nelson R. Basins
- Biota Transfer Controls: None Indicated

Arctic Ocean Basin

Churchill River Basin

Nelson River Basin

Churchill River Diversion

Canada Drainage Basins, 1985; Manitoba Hydro Website, 2002; National Atlas.Gov, 2002

The Lake St. Joseph Diversion

Canada Drainage Basins, 1985; Hydro One Website, 2002; National Atlas.Gov, 2002

The Lake St. Joseph Diversion

- Purpose: Hydroelectric Power Generation
- Constructed By: Hydro-Electric Power Commission of Ontario
- Constructed: 1950's
- Flow: 3,072 cfs (87 m^3/s)
- Connections: James Bay Basin to Nelson R. Basin
- Biota Transfer Controls: None Indicated

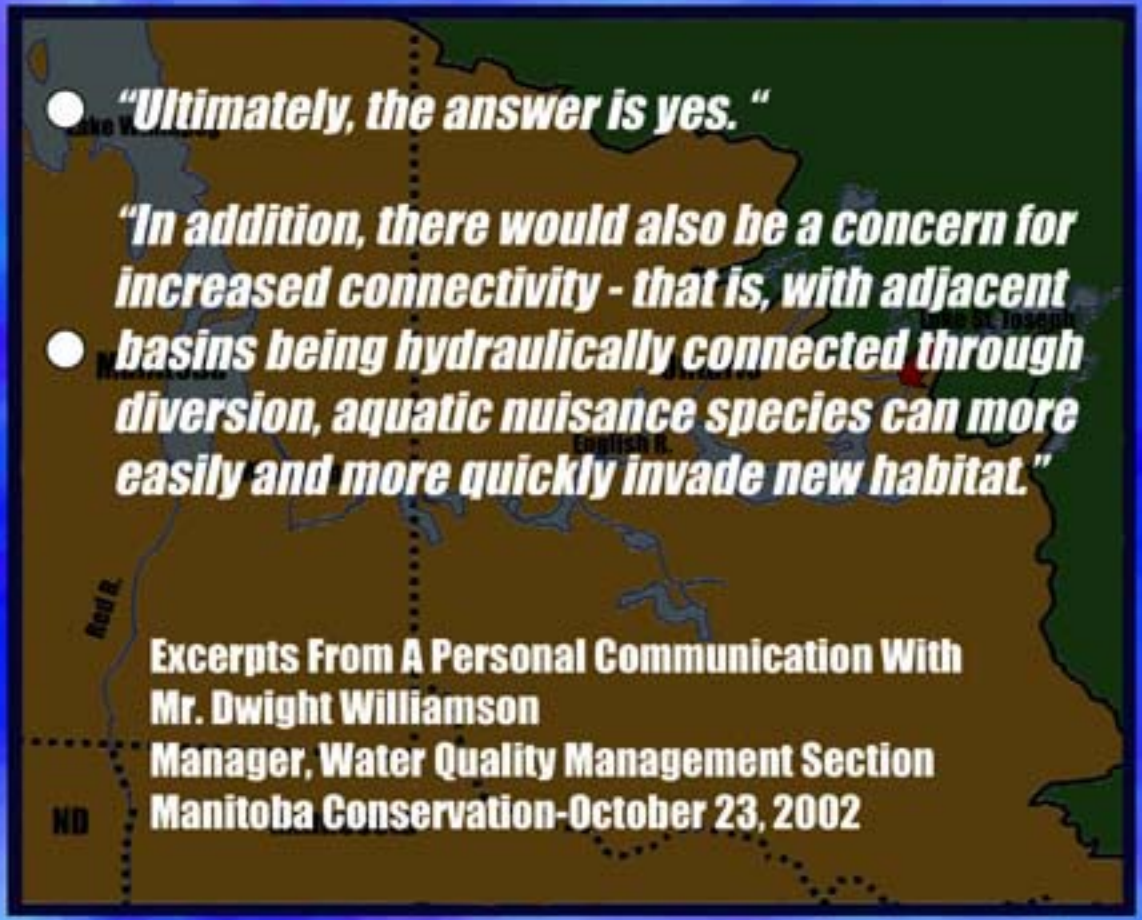
Nelson River Basin

James Bay Basin

Lake St. Joseph Diversion

Canada Drainage Basins, 1985; Hydro One Website, 2002; National Atlas.Gov, 2002

Does The Lake St. Joseph Interbasin Transfer Represent An Environmental Concern?



- *"Ultimately, the answer is yes. "*
- *"In addition, there would also be a concern for increased connectivity - that is, with adjacent basins being hydraulically connected through diversion, aquatic nuisance species can more easily and more quickly invade new habitat."*

Excerpts From A Personal Communication With
Mr. Dwight Williamson
Manager, Water Quality Management Section
Manitoba Conservation-October 23, 2002

Given That There Is Concern About The Lake St. Joseph Diversion

- What Protective Measures Are In Place To Prevent Biota Transfer?
- Concerns About Preventing Transfer Of Biota? Zebra Mussels, Eurasian Water Milfoil?
- Would Canada Be Willing To Stop Or Treat The Lake St. Joseph Diversion If An Exotic Species Was Found?
- What Studies Have Been Done To Determine If There Are Any Non-Native Species That Could Be Transferred Via The Lake St. Joseph Diversion?

The Long Lake And Ogoki River Diversions

Hudson Bay Basin

Great Lakes Basin

Long Lake Diversion

Ogoki River Diversion

Canada Drainage Basins, 1985; Hydro One Website, 2002; National Atlas.Gov, 2002

The Long Lake And Ogoki River Diversions

- Purpose: Hydroelectric Power Generation
- Constructed By: Hydro-Electric Power Commission of Ontario
- Constructed: 1948 (For Both)
- Flow: Long Lake 1,377 cfs (39 m^3/s), Ogoki River 4,273 (121 m^3/s)
- Connections: James Bay Basin (Hudson Bay) To Great Lakes Basin
- Biota Transfer Controls: None Indicated

Hudson Bay Basin

Great Lakes Basin

Long Lake Diversion

Ogoki River Diversion

Canada Drainage Basins, 1985; Hydro One Website, 2002; National Atlas.Gov, 2002

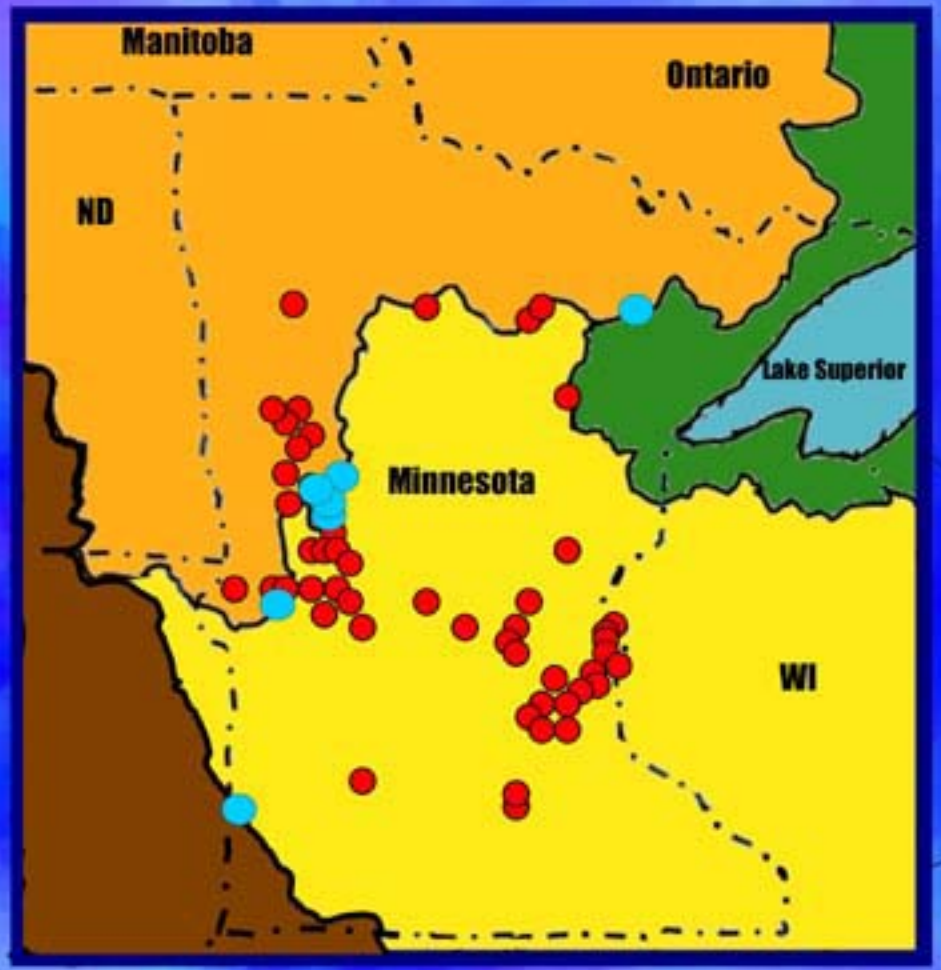
The Chicago Sanitary And Shipping Canal

Canada Drainage Basins, 1985 ; National Atlas.Gov Website, 2002; Chicago Public Library Website, 2002; University Of Wisconsin Seagrant Webpage, 2002

The Chicago Sanitary And Shipping Canal

- Purpose: Sewage Dilution, Navigation, and Hydroelectric Power Generation
- Constructed By: Metropolitan Sanitary District of Greater Chicago
- Constructed: 1900, With Additional Connections in 1910, and 1922 (Now 71 Miles of Canals)
- Flow: 3,213 cfs
- Connections: Great Lakes Basin to Mississippi River Basin (Both Ways)
- Biota Transfer Controls: Experimental Electrical Barrier Completed, Permanent Barrier Proposed; Additional Controls Proposed

Minnesota Interbasin Transfers



- Hudson Bay Basin
- Great Lakes Basin
- Mississippi River Basin
- Missouri River Basin
- Closed-Basin Lakes With Outlet
- Interbasin Water Transfer Projects

Pers. Comm. Merritt, 2003; Pers. Comm. With Various MNDNR Area Hydrologists, 2003; Pers. Comm. Moore, 2003; Pers. Comm. with Mel Sinn,MNDNR 2002; Various MNDNR Protected Waters Permits (1991, 94, 97, 98); Union/Sara Operation Manual, 1999; Trotta, 1988

Minnesota Interbasin Transfers

- Purpose: Lake Level Control, Irrigation, Sewer, Water Supply, Mine Dewatering
- Constructed By: Various; From MNDNR, To USACE, To Lake Improvement Districts (LID), To Private Citizens
- Constructed: Various; With 79 Outlets, and 11 Projects Having Occurred Within The Last Century To Present Time
- Flow: Maximum Discharge From 14 lakes and 11 Projects of 220 cfs; Flow From Remaining 65 Lakes Is Unknown; Additional/Future Projects ?
- Connections: Closed-Basin Lakes To External Drainages, And Transfers Across Major Basin Divides
- Biota Transfer Controls: 4 Lakes With Screens, Water Quality Monitoring Required On Certain Drained Lakes

Hudson Bay Basin

Great Lakes Basin

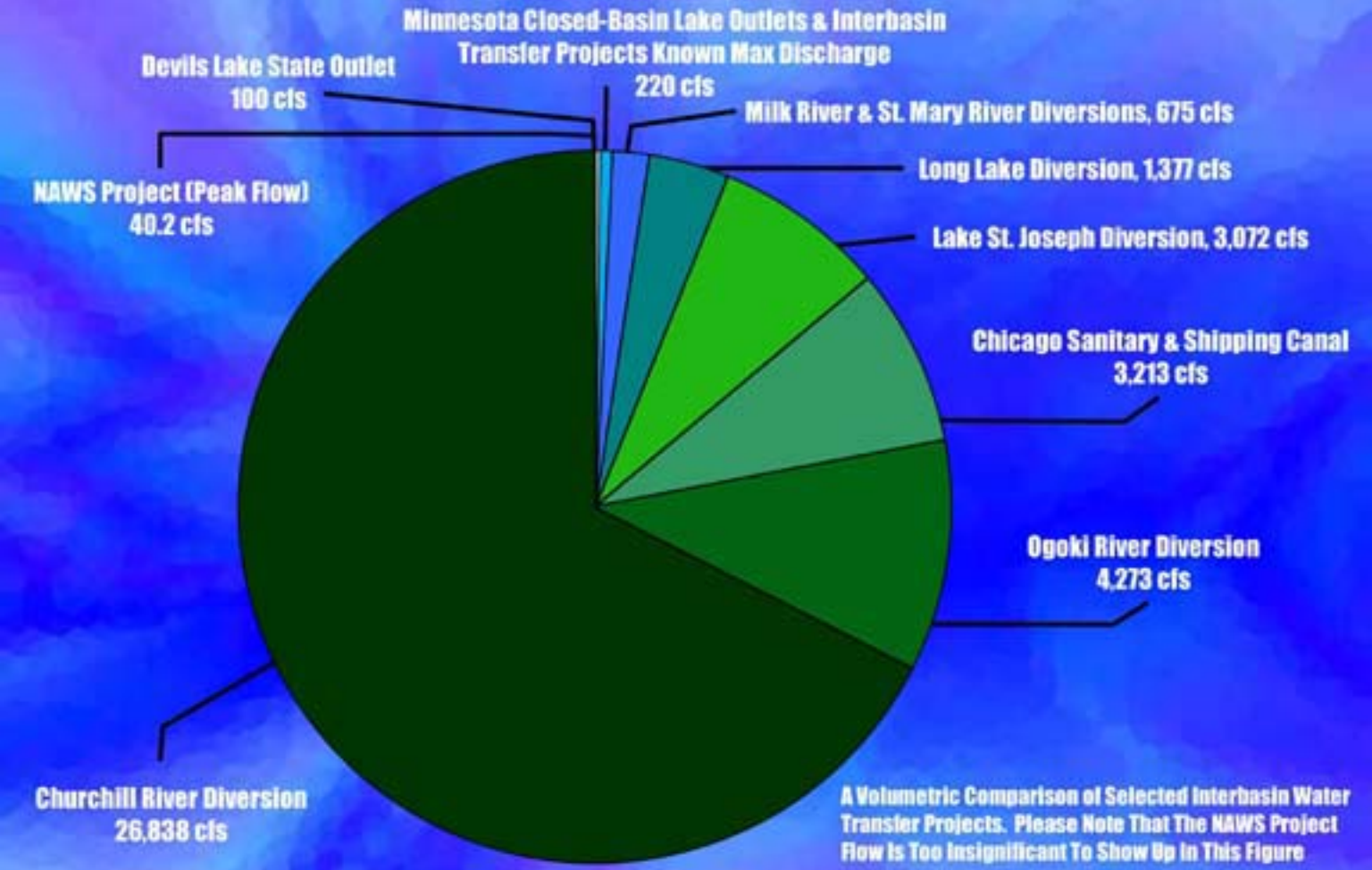
Mississippi River Basin

Missouri River Basin

Closed-Basin Lakes With Outlet

Interbasin Water Transfer Projects

Selected Interbasin Transfer Projects In North America



A Volumetric Comparison of Selected Interbasin Water Transfer Projects. Please Note That The NAWS Project Flow Is Too Insignificant To Show Up In This Figure

Shell Lake Outlet, Wisconsin

- Closed Basin Lake
- Water Quality Concerns
- Water Quantity Concerns
- Biota Transfer Concerns
- Drains Into Mississippi
- 20 cfs Maximum Flow
- Only EA Conducted
- No Objection From Minnesota

WIDNR Shell Lake EA, 2002

The Devils Lake Outlet
Wisconsin

Great Lakes Basin

Mississippi River Basin

Devils Lake Outlet

The Capital Times, 2002; Wisconsin DNR News & Outdoor Report, 2002

The Devils Lake Outlet
Wisconsin

- Purpose: Nutrient/Phosphorus Removal; Flood Protection
- Constructed By: Both WQ & Flooding Wisconsin Department of Natural Resources;
- Constructed: WQ, 2002; Flooding ?
- Flow: WQ, 3 cfs (0.08 m^3/s); Flooding ?
- Connections: Closed-Basin Lake to Mississippi River Basin
- Biota Transfer Controls: None Indicated For Either Outlet

Great Lakes Basin

Mississippi River Basin

Devils Lake Outlet

The Capital Times, 2002; Wisconsin DNR News & Outdoor Report, 2002


Non-Native Biota
Boats
Animal Transport
BASIN BOUNDARIES
Anglers
Natural Connections
Future Projects
Fish Stocking
Other Outlets and Diversions